Amendments to the Claims

This listing of the claims replaces all prior versions and listing of the claims in the present application.

Listing of Claims

1. (currently amended) An inductively coupled power transfer pick-up comprising:

a pick-up resonant circuit comprising a capacitive element and an inductive element adapted to receive power from a magnetic field associated with a primary conductive path to supply a load, and one of the capacitive element and the inductive element comprising a controlled reactive element;

a phase device configured to sense the phase of a voltage or current in the pick-up resonant circuit;

a sensor configured to sense a power requirement of the load; and

a controller configured to selectively tune or de-tune the pick-up resonant circuit in response to the load power requirement sensed by the sensor by selectively electrically connecting or disconnecting the controlled reactive element to or from the pick-up resonant circuit in each cycle of the voltage or current dependent on the sensed phase to vary ~~varying~~ the effective capacitance or inductance of the controlled reactive element of the pick-up resonant circuit to

control the transfer of power to the pick-up resonant circuit dependant on the sensed load power requirement.

2 (previously presented) The inductively coupled power transfer pick-up as claimed in claim 1 wherein the controlled reactive element comprises a switching device configured to allow the controlled reactive element to be selectively electrically connected to the pick-up resonant circuit.

3. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 2 wherein the controller is operable to control the switching device so that the apparent capacitance or inductance of the controlled reactive element is varied to thereby tune or detune the pick-up resonant circuit.

4. (canceled)

5. (currently amended) The inductively coupled power transfer pick-up as claimed in claim 2, ~~comprising:~~

~~a phase device configured to sense the phase of a voltage or current in the pick up resonant circuit; and~~

~~whereby~~ wherein the controller actuates the switching device to allow the controlled reactive element to be electrically connected to or disconnected from the pick-up resonant circuit dependant on the sensed phase.

6. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 5 wherein:

the controlled reactive element comprises an inductor;

the phase device senses a voltage in the pick-up resonant circuit; and

the controller is operable to switch the switching device to electrically connect or disconnect the inductor to or from the pick-up resonant circuit a predetermined time period after a sensed voltage zero crossing.

7. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 2 further comprising:

a frequency sensing device configured to sense the frequency of the pick-up resonant circuit whereby the controller actuates the switching device to allow the controlled reactive element to be electrically connected to or disconnected from the pick-up resonant circuit dependant on the sensed frequency to alter the natural resonant frequency of the pick-up resonant circuit.

8. (currently amended) The inductively coupled power transfer pick-up as claimed in claim 2 wherein:

the phase sensing device senses the frequency of the pick-up resonant circuit; and

~~whereby~~ the controller actuates the switching device to allow the controlled reactive element to be electrically connected to or disconnected from the pick-up resonant circuit dependant on the sensed frequency to alter the natural resonant frequency of the pick-up resonant circuit.

9. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 6, wherein the controller is

adapted to activate the switching device to connect the inductor to the pick-up resonant circuit after the predetermined time period following a voltage zero crossing has elapsed, and further adapted to allow the switching device to be deactivated when the voltage again reaches substantially zero.

10. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 6, wherein the controller is capable of varying the predetermined time period between substantially 0 electrical degrees and substantially 180 electrical degrees.

11. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 6 wherein the controller is capable of varying the predetermined time period between substantially 90 electrical degrees and substantially 150 electrical degrees.

12. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 6 wherein the inductor is connected in parallel with a tuning capacitor of the pick-up resonant circuit.

13. (currently amended) The inductively coupled power transfer pick-up as claimed in claim 6 ~~further comprising:~~ wherein the inductor ~~comprising~~ comprises two terminals, and wherein[[;]] [[and]] the switching device comprises ~~comprising~~ at least two controllable semiconductor switching elements, a

respective semiconductor switching element being connected between each terminal and the pick-up resonant circuit.

14. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 13 wherein each switching element comprises an anti-parallel diode connected thereacross.

15. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 13 wherein the semiconductor switch elements comprises at least one of IGBT's, MOSFETS, MCT's, and BJT's.

16. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 3 wherein the controlled reactive element comprises a pick-up coil or is connected in parallel with the pick-up coil.

17. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 5 wherein:

the controlled reactive element comprises a capacitor;

the phase sensing device senses a voltage in the pick-up resonant circuit; and

the controller is operable to switch the switching device to electrically connect or disconnect the capacitor to or from the pick-up resonant circuit in a predetermined time period after a sensed voltage zero crossing.

18. (currently amended) The inductively coupled power transfer pick-up as claimed in claim 17 further comprising:

a frequency sensing device configured to sense the frequency of the pick-up resonant circuit, and

~~whereby~~ wherein the controller actuates the switching device to allow the capacitor to be electrically connected to or disconnected from the pick-up resonant circuit dependant on the sensed frequency to alter the natural resonant frequency of the pick-up resonant circuit.

19. (currently amended) The inductively coupled power transfer pick-up as claimed in claim 17 wherein:

the phase sensing device senses the frequency of the pick-up resonant circuit; and

~~whereby~~ the controller actuates the switching device to allow the capacitor to be electrically connected to or disconnected from the pick-up resonant circuit dependant on the sensed frequency to alter the natural resonant frequency of the pick-up resonant circuit.

20. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 17 wherein the controller is adapted to activate the switching device to disconnect the capacitor from the pick-up resonant circuit after the predetermined time period following a voltage zero crossing has elapsed.

21. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 17 wherein the controller is capable of varying the predetermined time period between

substantially 0 electrical degrees and substantially 90 electrical degrees.

22. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 17 wherein the capacitor is connected in parallel with a tuning capacitor of the pick-up resonant circuit.

23. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 22 wherein a capacitance of the capacitor is substantially equal to a capacitance of the tuning capacitor.

24. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 17 wherein:

the capacitor comprises two terminals, and

the switching device comprises two controllable semiconductor switching elements, a respective semiconductor switching element being connected between each terminal and the pick-up resonant circuit.

25. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 24 wherein each switching element comprises an anti-parallel diode connected thereacross.

26. (previously presented) The inductively coupled power transfer pick-up as claimed in claim 24 wherein the semiconductor switch elements comprise at least one of IGBT's, MOSFETS, and BJT's.

27. (currently amended) The inductively coupled power transfer pick-up as claimed in claim 17 wherein the ~~variable reactance~~ capacitor comprises the tuning capacitor of the pick-up resonant circuit.

28. (currently amended) An inductively coupled power transfer system comprising:

a power supply comprising a resonant converter to provide alternating current to a primary conductive path of the inductively coupled power transfer system;

one or more inductively coupled power transfer system pick-up devices, each of said pick-up devices comprising:

a pick-up resonant circuit comprising:

a capacitive element; and

an inductive element adapted to receive power from a magnetic field associated with a primary conductive path to supply a load;

a phase device configured to sense the phase of a voltage or current in the pick-up resonant circuit;

a sensor configured to sense a power requirement of the load; and

a controller configured to selectively tune or de-tune the pick-up resonant circuit in response to the load power requirement sensed by the sensor by selectively electrically connecting or disconnecting the controlled reactive element to or from the pick-up resonant circuit in each cycle of the voltage or current

dependent on the sensed phase to vary ~~varying~~ the effective capacitance or inductance of the controlled reactive element of the pick-up resonant circuit to control the transfer of power to the pick-up resonant circuit dependant on the sensed load power requirement.

29. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the primary conductive path comprises one or more turns of electrically conductive material.

30. (previously presented) The inductively coupled power transfer system as claimed in claim 29 wherein the primary conductive path is provided beneath a substantially planar surface.

31. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the primary conductive path comprises at least one region about which there is a greater magnetic field strength than one or more other regions of the path.

32. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the primary conductive path comprises one or more lumped inductances or one or more distributed inductances.

33. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the primary

conductive path is mounted adjacent to an amorphous magnetic material to provide a desired magnetic flux path.

34. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the pick-up resonant circuit comprises an amorphous magnetic material adjacent to the pick-up coil to provide a desired magnetic flux path.

35. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the pick-up resonant circuit is battery-free.

36. (previously presented) The inductively coupled power transfer system as claimed in claim 28 wherein the pick-up resonant circuit comprises a super-capacitor.

37. (currently amended) A method for controlling power drawn by an inductively coupled power transfer pick-up, the method comprising the steps of:

<u>sensing the phase of a voltage or current in a pick-up resonant circuit;</u>

sensing a power requirement of a load supplied by the pick-up resonant circuit; and

selectively tuning or detuning the pick-up resonant circuit in response to the power requirement sensed by the sensor by <u>selectively electrically connecting or disconnecting the controlled reactive element to or from the pick-up resonant circuit in each cycle of the voltage or current dependent on the</u>

sensed phase to vary ~~varying~~ the effective capacitance or inductance of a controlled reactive element of the pick-up resonant circuit to control the transfer of power to the pick-up resonant circuit dependant on the sensed load power requirement.

38. (currently amended) A method as claimed in claim 37 wherein the step of tuning or detuning the pickup resonant circuit comprises the step of moving a resonant frequency of the pick-up resonant circuit toward or away from a tuned condition.

39. (canceled)

40. (previously presented) A method as claimed in claim 37 further comprising the step of sensing a frequency of a current or voltage in the pick-up resonant circuit.

41. (previously presented) A method as claimed in claim 40 further comprising the steps of:

comparing the sensed frequency with a nominal frequency for the pick-up resonant circuit; and

tuning or de-tuning toward or away from a nominal frequency dependant on the sensed load.

42. (previously presented) A method as claimed in claim 37 further comprising the step of:

selectively switching the controlled reactive element into or out of the pick-up resonant circuit to alter the effective inductance or capacitance of the controlled reactive element to thereby tune or de-tune the pick-up resonant circuit.

43. (canceled)

44. (currently amended) A method as claimed in claim [[43]]42, further comprising the steps of:

sensing a phase of a voltage; and

electrically connecting the controlled reactive element to the pick-up resonant circuit in a predetermined time period after a sensed voltage zero crossing.

45. (previously presented) A method as claimed in claim 42 further comprising the steps of:

sensing the frequency of the pick-up resonant circuit; and

activating a switching device to electrically connect or disconnect the controlled reactive element to or from the pick-up resonant circuit dependant on the sensed frequency to alter the natural resonant frequency of the pick-up resonant circuit.

46. (previously presented) A method as claimed in claim 42 further comprising the steps of:

comparing the sensed frequency with a nominal frequency; and

varying the predetermined time period to tune the pick-up resonant circuit toward or away from the nominal frequency.

47. (previously presented) A method as claimed in claim 42 further comprising the steps of:

activating a switching device to connect the controlled reactive element to the pick-up resonant circuit after the predetermined time period following a voltage zero crossing has elapsed; and

allowing the switching device to be deactivated when the voltage again reaches substantially zero.

48. (previously presented) A method as claimed in claim 42 further comprising the step of selecting the predetermined time period from a range between substantially 0 electrical degrees and substantially 180 electrical degrees.

49. (previously presented) A method as claimed in claim 42 further comprising the step of selecting the predetermined time period from a range between substantially 90 electrical degrees and substantially 150 electrical degrees.

50. (currently amended) A method as claimed in claim ~~[[43]]~~42, further comprising the steps of:

sensing a phase of a voltage; and

electrically disconnecting the controlled reactive element to the pick-up resonant circuit in a predetermined time period after a sensed voltage zero crossing.

51. (previously presented) A method as claimed in claim 50 wherein:

the controlled reactive element comprises a capacitor; and the predetermined time period is selected from a range between substantially 0 electrical degrees and substantially 90 electrical degrees.

52-54. (canceled)